

# PCMQ080R120EQ

## 1,200V 35A 70mΩ Silicon Carbide MOSFET

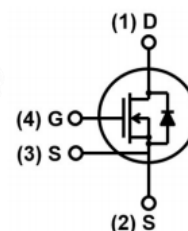
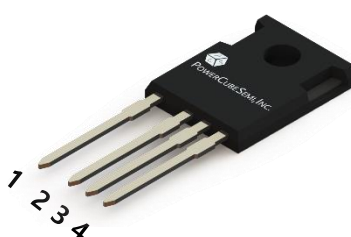
### Features

- High-Speed Switching
- Reliable Body Diode
- All parts tested to greater than 1,400V
- Avalanche tested to 200mJ
- Driver Source Pin for Gate Driving
- Higher System Efficiency
- Lower Capacitance
- AEC-Q101 Qualified

### Applications

- Switch Mode Power Supplies, UPS
- Solar Inverters
- High Voltage DC/DC Converters
- EV Charging stations
- Motor Drives
- Induction Heating and Welding

### Package Outline



- (1) D (Drain)  
(2) S (Source)  
(3) S (Driver Source)  
(4) G (Gate)



### Absolute Maximum Ratings

$T_j = 25^\circ\text{C}$  unless otherwise noted

Symbol	Parameter	Value	Units
$V_{DSS}$	Drain-Source Voltage	1200	V
$I_D$	Drain Current - Continuous ( $T_j = 25^\circ\text{C}$ )	35	A
	- Continuous ( $T_j = 100^\circ\text{C}$ )	26	A
$I_{DM}$	Drain Current - Pulsed	80	A
$V_{GSS\ Max}$	Gate-Source Voltage	-10 / +25	V
$V_{GSS}$	Gate-Source Voltage (Recommended operational)	-5 / +20	V
$P_D$	Power Dissipation ( $T_j = 25^\circ\text{C}$ )	188	W
$T_J, T_{STG}$	Operating and Storage Temperature Range	-55 to +175	$^\circ\text{C}$

### Thermal Characteristics

Symbol	Parameter	Value			Units
		Min	Typ	Max	
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	-	0.65	0.80	$^\circ\text{C/W}$
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	-	-	40.0	

## Electrical Characteristics

### Static Electrical Characteristics $T_j = 25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
$BV_{DSS}$	Drain-Source Breakdown Voltage	$V_{GS} = 0\text{ V}, I_D = 1\text{ mA}$	1200	-	-	V
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS} = 1200\text{ V}, V_{GS} = 0\text{ V}$	-	0.1	1.0	$\mu\text{A}$
		$V_{DS} = 1200\text{ V}, V_{GS} = 0\text{ V}, T_j = 175^\circ\text{C}$	-	1	-	
$I_{GSS}(+)$	Gate-Source Leakage Current	$V_{GS} = 20\text{ V}, V_{DS} = 0\text{ V}$	-	-	$\pm 100$	nA
$I_{GSS}(-)$		$V_{GS} = -5\text{ V}, V_{DS} = 0\text{ V}$	-	-		
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = 10\text{ mA}$	2	2.8	4	V
		$V_{DS} = V_{GS}, I_D = 15\text{ mA}$	2	2.9	4	
$R_{DS(on)}$	Drain-Source On-Resistance	$V_{GS} = 20\text{ V}, I_D = 20\text{ A}$	-	70	80	m $\Omega$
		$V_{GS} = 20\text{ V}, I_D = 10\text{ A}$	-	68	78	
$R_G$	Gate Resistance	$f = 1\text{ MHz}, V_{AC} = 25\text{ mV}$	-	5.3	-	$\Omega$

### Dynamic Characteristics

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
$C_{iss}$	Input Capacitance	$V_{DS} = 1000\text{ V}, V_{GS} = 0\text{ V}, f = 200\text{ kHz}$	-	1300	-	pF
$C_{oss}$	Output Capacitance		-	68	-	
$C_{rss}$	Reverse Transfer Capacitance		-	5	-	

### Switching Characteristics

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 800\text{ V}, V_{GS} = -5 / 20\text{ V}, I_D = 20\text{ A}, L = 975\text{ uH}, R_G = 2.5\text{ }\Omega$	-	9	-	ns
$t_r$	Turn-On Rise Time		-	4	-	
$t_{d(off)}$	Turn-Off Delay Time		-	15	-	
$t_f$	Turn-Off Fall Time		-	10	-	
$E_{on}$	Turn-On Switching loss	$V_{DD} = 800\text{ V}, V_{GS} = -5 / 20\text{ V}, I_D = 20\text{ A}, L = 975\text{ uH}, R_G = 2.5\text{ }\Omega$	-	167	-	$\mu\text{J}$
$E_{off}$	Turn-Off Switching loss		-	27	-	
$Q_g$	Total Gate Charge	$V_{DS} = 800\text{ V}, I_D = 20\text{ A}, V_{GS} = -5 / 20\text{ V}$	-	61	-	nC
$Q_{gs}$	Gate-Source Charge		-	24	-	
$Q_{gd}$	Gate-Drain Charge		-	14	-	

### Body Diode Characteristics

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
$I_S$	Maximum Continuous Diode Forward Current	$V_{GS} = -5\text{ V}, T_j = 25^\circ\text{C}$	-	-	43	A
$I_{SM}$	Maximum Pulsed Diode Forward Current		-	-	80	A
$V_{SD}$	Diode Forward Voltage	$V_{GS} = -5\text{ V}, I_S = 10\text{ A}$	-	3.9	-	V
$t_{rr}$	Reverse Recovery Time	$V_R = 800\text{ V}, V_{GS} = -5\text{ V}, I_S = 20\text{ A}, dI_F / dt = 8.0\text{ A/ns}$	-	8	-	ns
$Q_{rr}$	Reverse Recovery Charge		-	130	-	nC
$I_{rr}$	Reverse Recovery Current		-	29	-	A

## Typical Characteristics

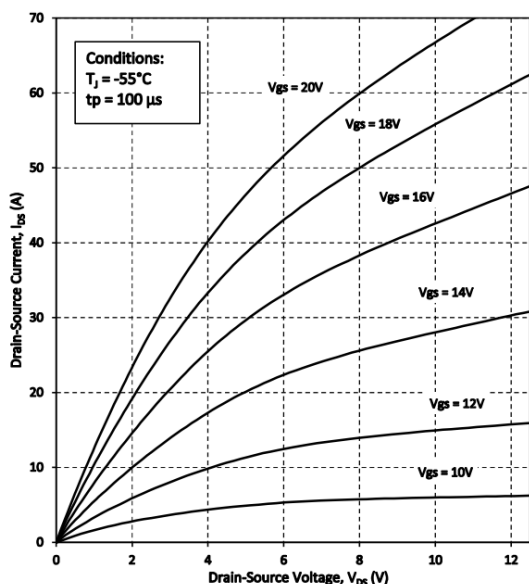


Figure 1. Output Characteristics at  $T_j = -55^\circ\text{C}$

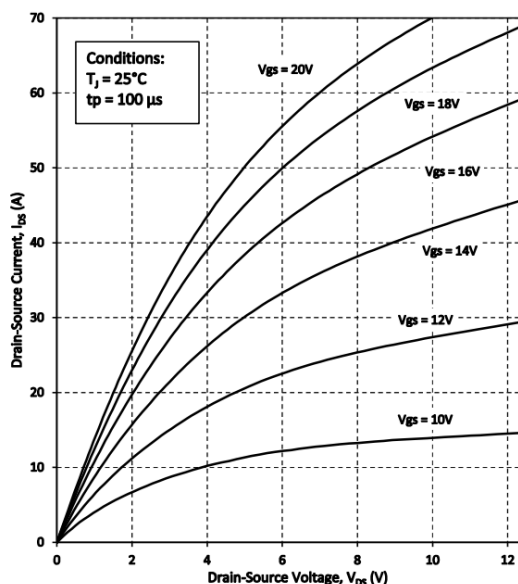


Figure 2. Output Characteristics at  $T_j = 25^\circ\text{C}$

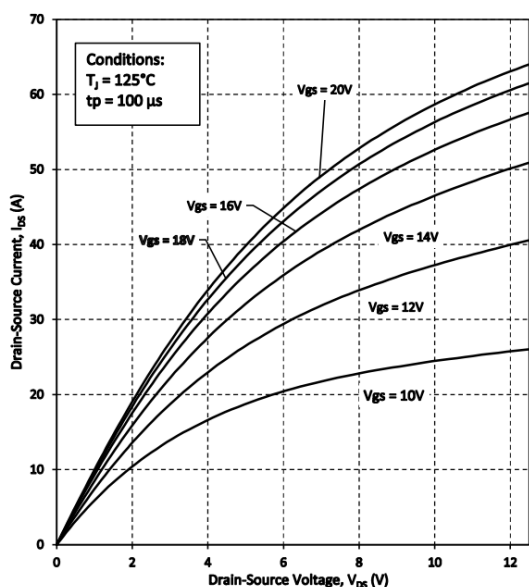


Figure 3. Output Characteristics at  $T_j = 125^\circ\text{C}$

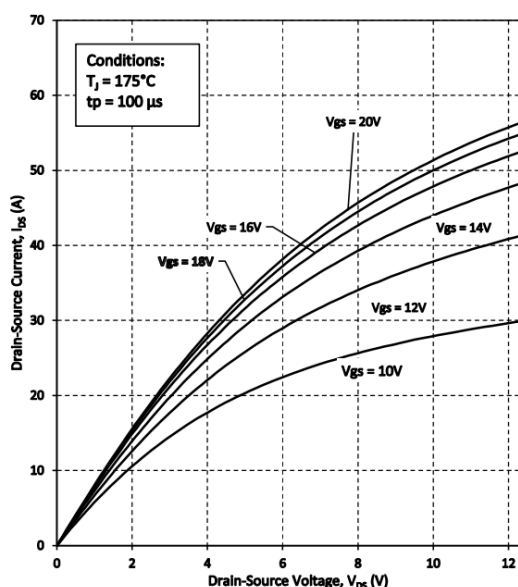


Figure 4. Output Characteristics at  $T_j = 175^\circ\text{C}$

## Typical Characteristics

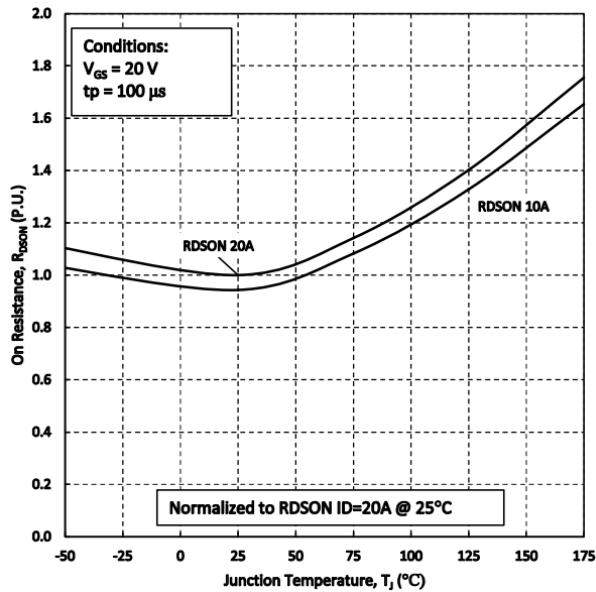


Figure 5. Normalized On-Resistance vs. Temperature

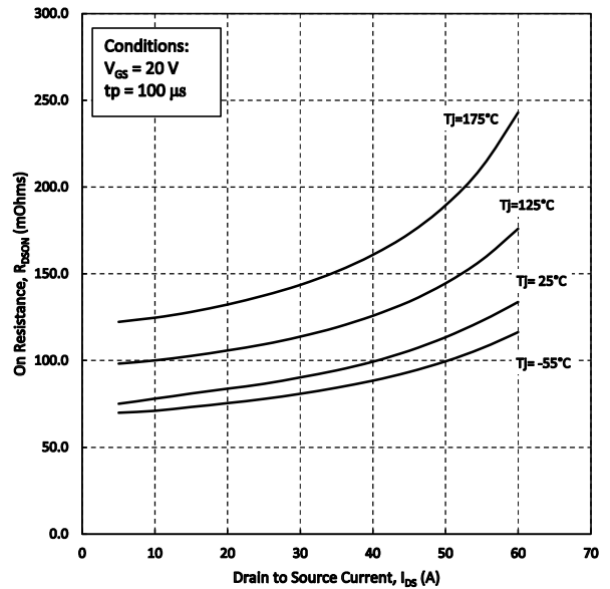


Figure 6. On-Resistance vs. Drain Current for Various Temperature

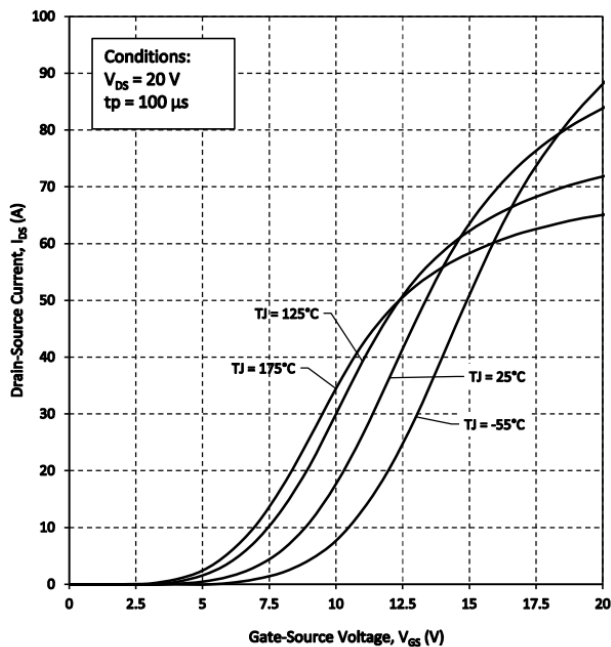


Figure 7. Transfer Characteristics for Various Junction Temperature

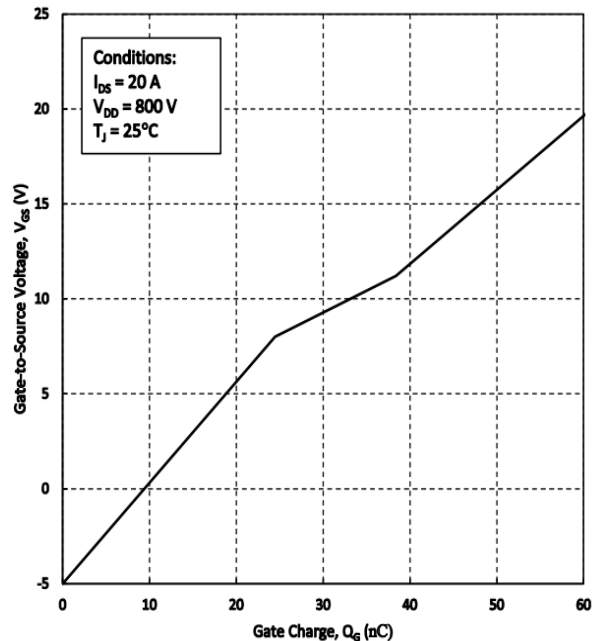


Figure 8. Gate Charge Characteristics

## Typical Characteristics

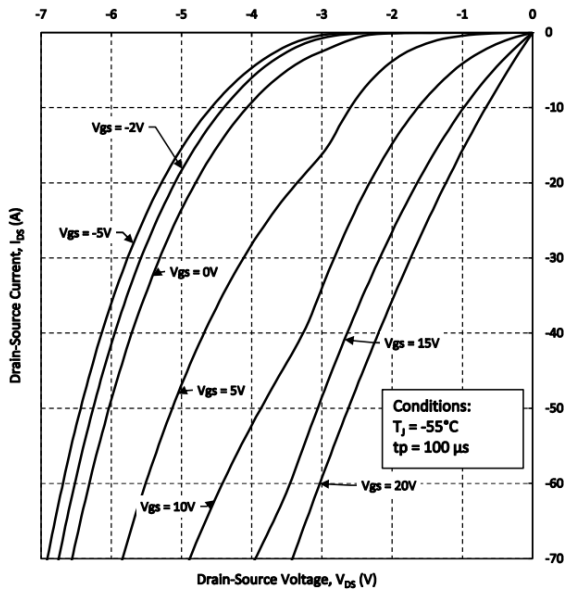


Figure 9. Body Diode Characteristics at  $T_j = -55^\circ\text{C}$

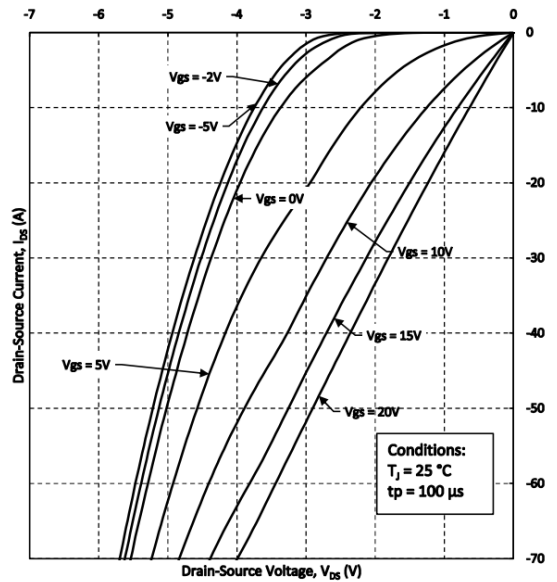


Figure 10. Body Diode Characteristics at  $T_j = 25^\circ\text{C}$

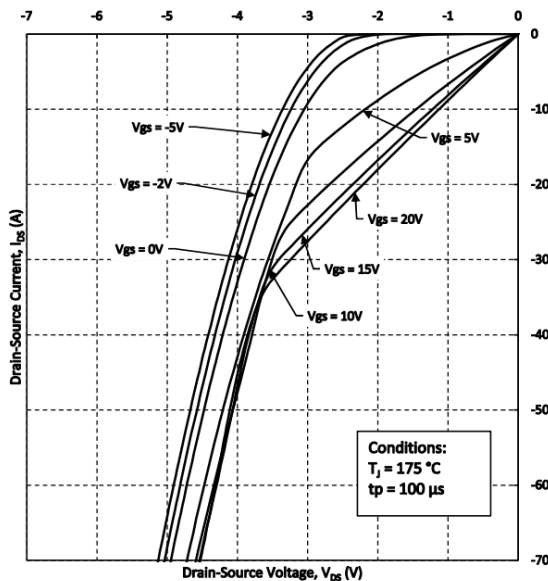


Figure 11. Body Diode Characteristics at  $T_j = 175^\circ\text{C}$

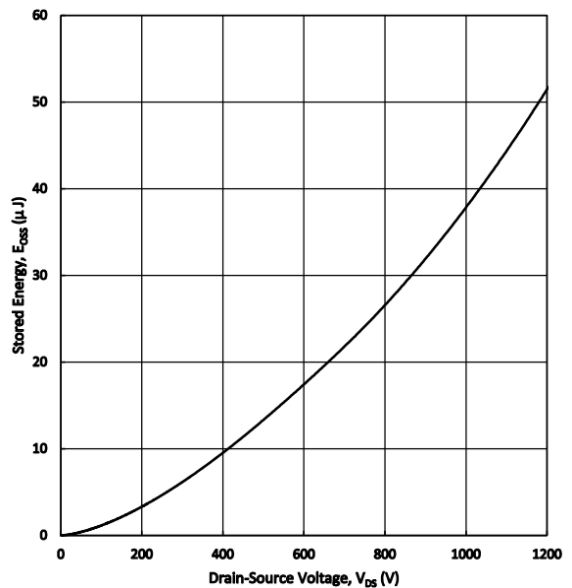


Figure 12. Output Capacitor Stored Energy

## Typical Characteristics

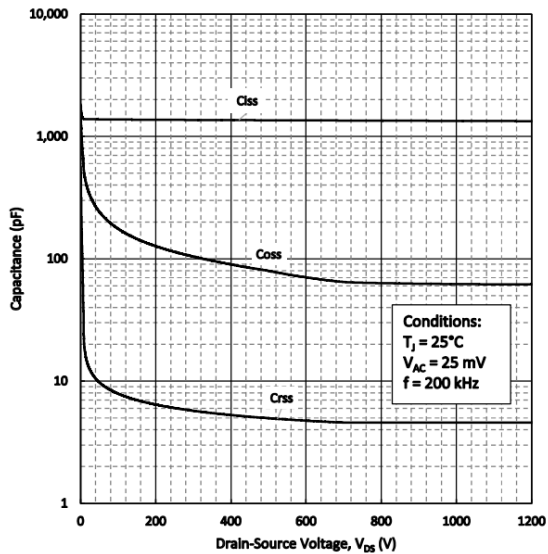


Figure 13. Capacitance vs Drain-Source Voltage

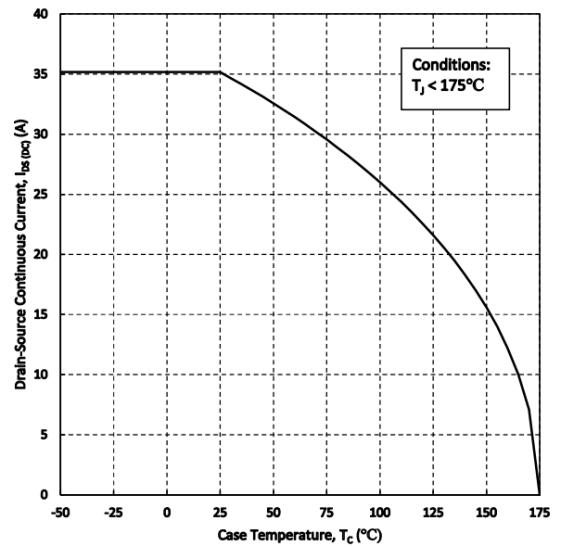


Figure 14. Continuous Drain Current Derating vs. Case Temperature

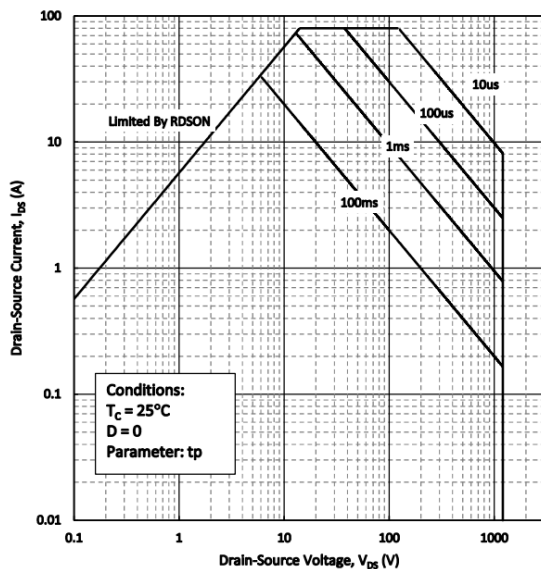


Figure 15. Safe Operating Area

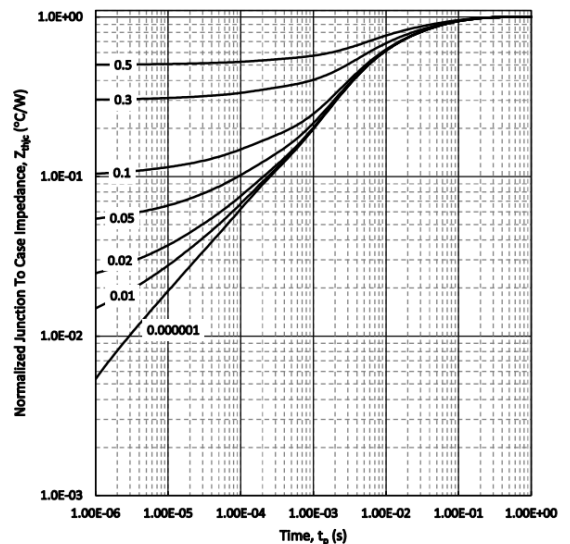


Figure 16. Transient Thermal Impedance (Junction to Case)

## Typical Characteristics

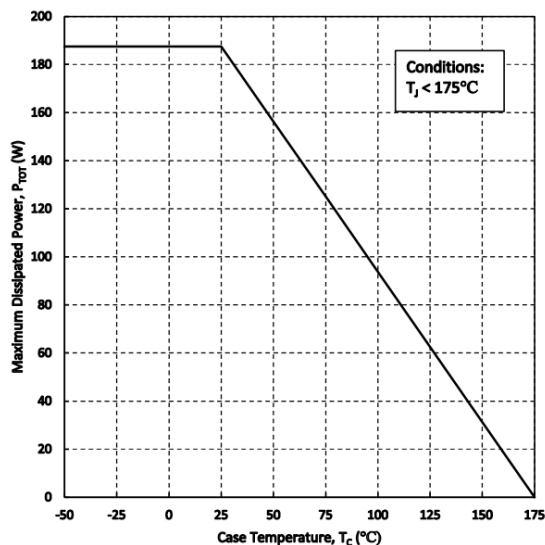


Figure 17. Maximum Power Dissipation Derating vs Case Temperature

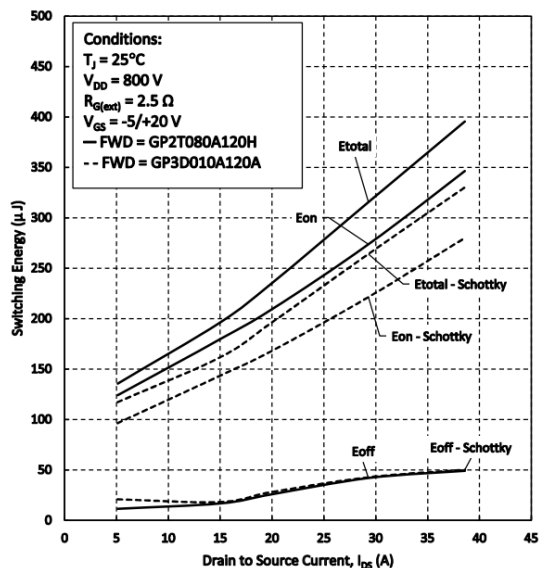


Figure 18. Clamped Inductive Switching Energy vs. Drain Current

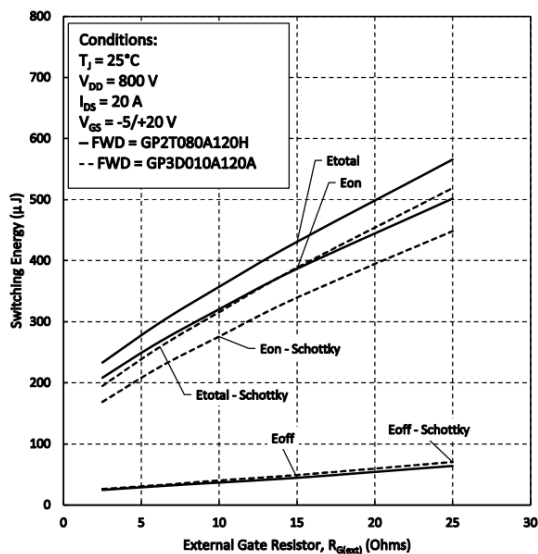


Figure 19. Clamped Inductive Switching Energy vs.  $R_G$

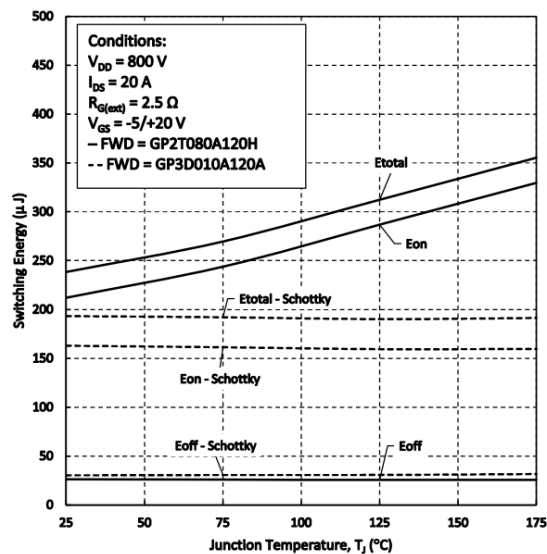
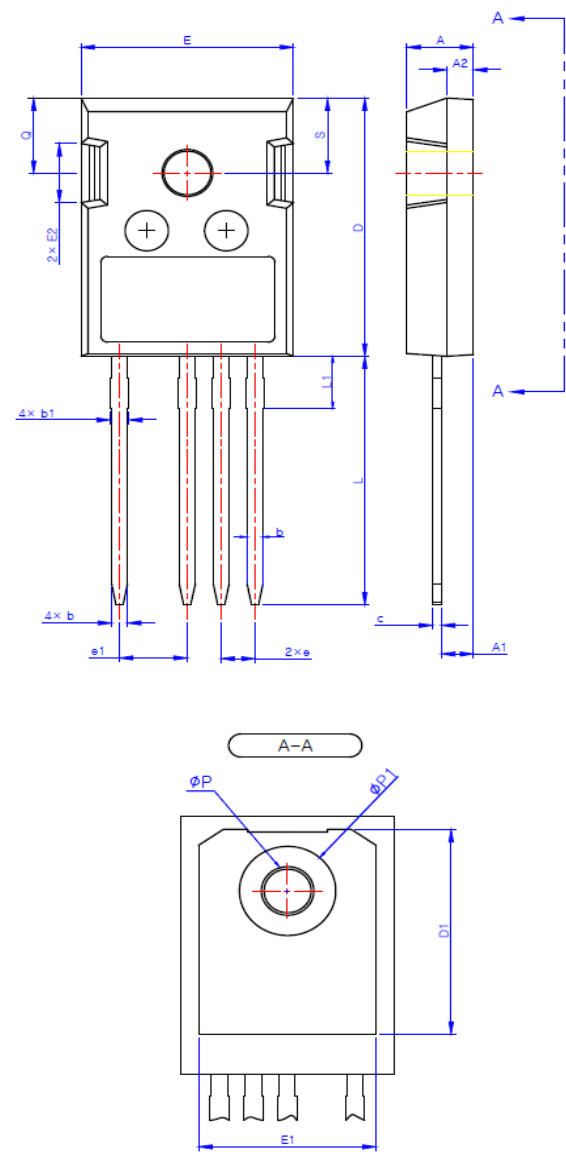


Figure 20. Clamped Inductive Switching Energy vs. Temperature

Package Information

Package Outline

Unit : mm



SYMBOL	DIMENSIONS			NOTES
	MIN	NOM	MAX	
A	4.80	-	5.20	
A1	2.29	-	2.54	
A2	1.90	-	2.10	
b	1.10	-	1.30	
b1	1.30	-	1.50	
c	0.50	-	0.70	
D	20.80	-	21.34	
D1	17.43	-	17.83	
E	15.75	-	16.13	
E1	13.06	-	13.46	
E2	4.32	-	4.83	
e	2.54 BSC			
e1	5.08 BSC			
L	19.85	-	20.25	
L1	-	-	4.49	
ØP	3.55	-	3.65	
ØP1	7.00	-	7.40	
Q	5.59	-	6.19	
S	6.15 BSC			